

Workshop Manual

Audi A4 2008 ➤

Audi A5 Cabriolet 2009 ➤

Audi A5 Coupé 2008 ➤

Audi Q5 2008 ➤

System description - entry and start authorisation

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List of Workshop Manual Repair Groups

Repair Group

01 - Self-diagnosis, electrical checks



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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01 – Self-diagnosis, electrical checks

1 General notes on entry and start authorisation function

1.1 General functions

The entry and start authorisation function is located in the hardware of the convenience system central control unit -J393- and is diagnosed at diagnosis address „05 - Entry and start authorisation“. Some functions are also diagnosed at address „46 - Convenience system central module“.

1.2 Entry and start authorisation: main functions

- ◆ Immobilizer V
- ◆ Communication with entry and start authorisation switch - E415- via LIN bus, including terminal control and ignition key removal lock
- ◆ Interface to radio-operated remote control and central locking
- ◆ Communication with electronic steering column lock control unit -J764- via LIN bus
- ◆ Optional extra: Advanced Key, reading in of entry and start authorisation button -E408- , of capacity sensors in doors and reception of signals from keyless aerals

1.3 Note for service

If a fault is detected in function „05 - Entry and start authorisation“, requiring convenience system central control unit -J393- to be renewed, function „46 - Replace control unit (Rep.gr. 57)“ must be performed in „Guided Fault Finding“ or „Guided Functions“. If the defective control unit is still fitted and is still accessible via diagnosis, data are read out and buffered in the function test before the control unit is renewed.

Subsequently, the following actions are performed in the function test:

- ◆ „* * - Service immobilizer“
- ◆ „Software Version Management“
- ◆ „Component protection“
- ◆ Reload buffered data

This requires an online connection for the tester, and the user must be authorised for the SeCo/SVM system.

2 Immobilizer V: function

2.1 General notes on immobilizer V

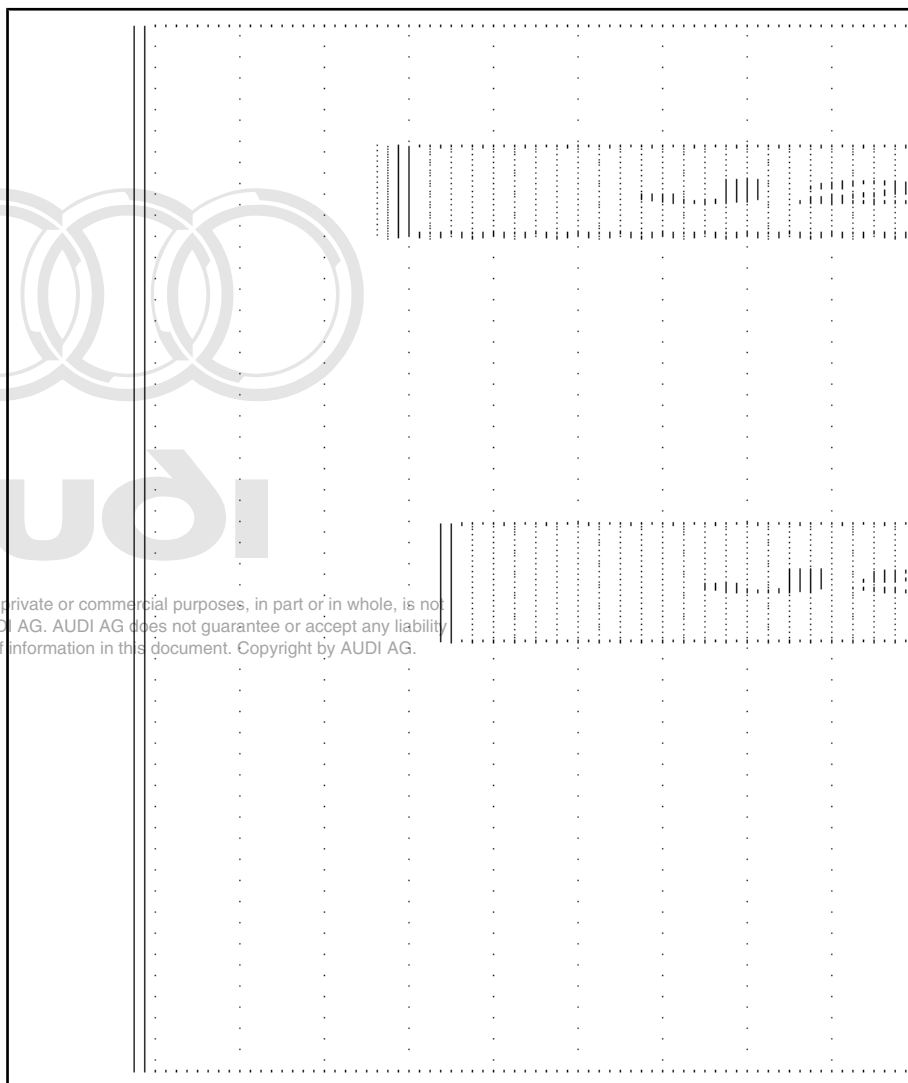
The immobilizer V was introduced with the Audi A5 Coupé and is also fitted on the A4 and Q5.

The function test to adapt the immobilizer V in Guided Fault Finding is „* - Service immobilizer“.

The function test is modular and also evaluates messages from the SeCo database. As modules are interchangeable, no actual components appear in the generated messages, only virtual control units. For this reason, the designations of some components differ from those shown in the current flow diagram. The table ⇒ [page 3](#) lists all components and designations from the function check.

2.2 System overview for immobilizer V

- Automatic gearbox control unit -J217-
- Engine control unit -J623-
- Engine control unit 2 -J624-
- Data bus diagnostic interface -J533-
- Convenience system central control unit -J393-
- Entry and start authorisation switch -E415-
- Electronic steering column lock control unit -J764-
- 1 - Drive train data bus
- 2 - Convenience data bus
- 3 - LIN bus
- 4 - Diagnostic data bus
- 5 - Network connection
- 6 - SeCo database



Engine control unit 2 -J624- and automatic gearbox control unit -J217- are only fitted optionally.

2.3 Designation of components of immobilizer V

Component	Abbreviations used in Guided Fault Finding	K-module number Diagnostic address	Comments
Engine control unit -J623-	MSG1/ECU1 (engine control unit 1)	K01 01 - Engine electronics	Engine control unit 1 is an active component of the immobilizer and must be adapted after renewal. Communication is routed via drive train data bus.
Convenience system central control unit -J393-	IMS (immobilizer control unit, corresponding to immobilizer master) BCM2 (body control module 2)	K05 05 - Entry and start authorisation K46 46 - Convenience system central module	The BCM2 incorporates diagnostic addresses 05 - Entry and start authorisation and 46 - Convenience system central module; therefore both K-module numbers (K05 and K46) exist. The immobilizer and component protection functions are implemented via address 05 - Entry and start authorisation and must be adapted when renewing the BCM2. Communication is routed via the convenience system data bus.
Entry and start authorisation switch -E415-	Ignition lock	-	Electronic ignition lock connected via LIN bus to BCM2. When renewing ignition lock, it need not be adapted, as it merely forwards information for the immobilizer from the key.
Electronic steering column lock control unit -J764-	ELV/ESL (electronic steering column lock)	KG1 05 - Entry and start authorisation	The electronic steering column lock is connected to the BCM2 via the same LIN bus as the ignition lock; therefore, it has no separate diagnostic address; however, it does have to be adapted to the immobilizer after being renewed. Diagnosis is performed via address 05 - Entry and start authorisation. The electronic steering column lock can be renewed as a separate unit without having to remove the steering column.
Engine control unit 2 - J624-	MSG2/ECU2 (engine control unit 2)	K11 11 - Engine electronics 2	Engine control unit 2 is an active component of the immobilizer and must be adapted after renewal. Engine control unit 2 is fitted optionally and depends on the engine code letters. Communication is routed via drive train data bus.
Automatic gearbox control unit -J217-	GSG/GCU (gearbox control unit)	K02 02 - Gearbox electronics	The gearbox control unit is an active component of the immobilizer and must be adapted after renewal. The gearbox control unit is fitted optionally. Communication is routed via the drive train data bus.

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Component	Abbreviations used in Guided Fault Finding	K-module number Diagnostic address	Comments
Data bus diagnostic interface -J533-	Gateway	K19 19 - Data bus diagnostic interface	The gateway is a passive component of the immobilizer and does not have to be adapted after being renewed. The gateway serves as a router from the convenience data bus to the drive train data bus.
Vehicle key -KD5708-	Key	-	The vehicle keys are active components of the immobilizer and must be adapted (matched) after being renewed. Between 0 and 8 keys can be adapted.

2.4 Adaption concept for immobilizer V

The „one-button solution“ has been implemented for immobilizer V.

All immobilizer components are adapted using the same functional check within „Guided Fault Finding“. This requires a tester of the VAS 505X family with an online connection.

Select the program „* * - Service immobilizer“ in „Guided Fault Finding“ or „Guided Functions“ mode and include in the test plan. The same program can be selected both under „* * - Functions - Immobilizer 5“ and under the respective control unit functions.

2.4.1 Functional checks to determine states of control units

Each control unit is either in **lifecycle state 1 (new)** or **2 (already adapted or swapped from another vehicle)**. Lifecycle state 3 occurs only in the convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“ and signifies that key adaption is currently active.

When adapted, all control units are in lifecycle state 2 and have the same „vehicle identification number“.

The following functional checks can be included in the test plan in „Guided Functions“ by choosing „* * - Functions - Immobilizer 5“ and in „Guided Fault Finding“ by choosing „* * - Immobilizer status of all control units“:

Functional check	Definition
„05 - IMS - Immobilizer overall status (Rep. gr.)“	Determines the status of the convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“ and of the vehicle keys
„05 - ESL - Immobilizer overall status (Rep. gr. 48)“	Determines status of electronic steering column lock control unit -J764-
„01 - Engine control unit - Immobilizer overall status (Rep. gr. 23/24)“	Determines status of engine control unit -J623-
„11 - Engine control unit 2 - Immobilizer overall status (Rep.gr. 23/24)“	Determines status of engine control unit 2 -J624-
„02 - Gearbox control unit - Immobilizer overall status (Rep. gr. 35/38)“	Determines status of automatic gearbox control unit -J217-

2.4.2 Notes for service

To be able to run the „* * - Service immobilizer“ program, only the convenience system central control unit -J393- , the electronic steering column lock control unit -J764- and a matched vehicle key are required. Only the systems present are then adapted. Missing or defective control units can be adapted by repeating the functional check at a later time.

Notes on matching keys:

The vehicle keys can be adapted within the „* * - Service immobilizer“ function. Only keys from one key set can be adapted. A new key set assigns the vehicle a „new identity“. Since the first key inserted is read, the system itself detects whether a „new identity“ is being learned. The user does not have to make a decision on the tester.

During vehicle key adaption, the specified and actual number of keys to be adapted is displayed both on the display of the control unit in dash panel insert -J285- and on the vehicle diagnostic tester VAS 505X. When the specified number of keys has been reached, the function test is automatically resumed. If not all keys can be adapted, the program can be continued by pressing the right arrow button. The adaption process can still be carried out without errors.

Between 0 and 8 keys can be adapted. If 0 keys are adapted, the vehicle can no longer be started.

It is generally only possible to start the engine when the „* * - Service immobilizer“ functional check has ended.

Notes on renewing control units:

When a control unit has been renewed, the relevant „Renewing ...“ functional check should be performed from the corresponding functions. All necessary functions of the control unit are then carried out, and the „* * - Service immobilizer“ program is run directly or included in the test plan.



Note

- ◆ *If the convenience system central control unit -J393- has been renewed and the vehicle has a manual gearbox, the default coding stipulates that the vehicle key removal lock is active. The coding can only be performed using „Software Version Management (SVM)“. This requires that terminal 15 be switched on. However, since terminal 15 is activated by the convenience system central control unit -J393- , which only happens once the immobilizer has been adapted, the following procedure must be observed in the program „46 - Renewing control unit (Rep.Gr. 57)“:*
- ◆ *The „* * - Service immobilizer“ program is run automatically in the functional check. In this case, only one vehicle key can be adapted initially. The program must nevertheless be continued.*
- ◆ *„Component protection“ is then automatically adapted, „Software Version Management“, including coding, is run and any adaption values read out at the beginning are written back.*
- ◆ *By automatically running the „* * - Service immobilizer“ program again, all remaining vehicle keys can subsequently be adapted.*

3 Terminal control and starting the engine

3.1 General notes on terminal control and starting the engine

The „entry and start authorisation“ system issues the authorisation for both terminal 15 and engine starting. A distinction can be made between „starting with the vehicle key“ and „starting with Advanced Key“.

3.2 Conditions for terminal 15 on

In addition to fault-free wiring, the following conditions must be met in order to switch on terminal 15:

- ◆ Convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“ must have been adapted to the immobilizer.
- ◆ Electronic steering column lock control unit -J764- must have been adapted to the immobilizer.
- ◆ The current vehicle key must have been adapted to the immobilizer.
- ◆ Electronic steering column lock control unit -J764- must be unlocked.

3.3 Conditions for starting the engine

In addition to the conditions from ➤ [page 6](#) , the following conditions must be met for the engine to start:

- ◆ Convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“ must have been coded.
- ◆ Engine control unit -J623- must have been adapted to the immobilizer.
- ◆ Engine control unit 2 -J624- , if fitted, must have been adapted to the immobilizer.
- ◆ „P1570 1570 Engine control unit disabled“ must not be entered in the event memory of an engine control unit.

3.4 Starting with vehicle key

The immobilizer V uses an entirely new type of operating logic for terminal control and for starting the engine. When the key is inserted (S-contact), the electronic ignition lock only differentiates between two different key positions:

- ◆ Key at home position, corresponding to S-contact on
- ◆ Key pressed

This results in the following operating concept:

Status before action	Action	Status after action
S-contact off (ignition off engine off)	– Insert key	S-contact on (ignition off engine off)
S-contact on (ignition off engine off)	– Remove key (vehicles with automatic gearbox: selector lever in P)	S-contact off (ignition off engine off)

Status before action	Action	Status after action
S-contact on (ignition off engine off)	– Press key (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed)	Ignition on (engine off)
S-contact on (ignition off engine off)	– Press key (vehicles with manual gearbox: clutch pressed; vehicles with automatic gearbox: brake pressed and selector lever in N or P)	Engine on
Ignition on (engine off)	– Press key (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed)	S-contact on (ignition off engine off)
Ignition on (engine off)	– Press key (vehicles with manual gearbox: clutch pressed; vehicles with automatic gearbox: brake pressed and selector lever in N or P)	Engine on
Engine on	– Press key (vehicles with manual gearbox: vehicle stationary; vehicles with automatic gearbox: selector lever in N or P)	S-contact on (ignition off engine off)

An emergency engine shut-off is also implemented which is the same for manual and automatic gearboxes. The following actions result in an emergency engine shut-off:

- Pressing and holding key
- Pressing key twice in one second

3.5 Starting engine with „Advanced Key“

As previously explained for starting the vehicle using the ignition key, the new operating logic for terminal control and starting the engine can also be easily transferred to vehicles with an „Advanced Key“. Like the electronic ignition lock, the Advanced Key differentiates between two different states of the entry and start authorisation button -E408- :

- ◆ Entry and start authorisation button -E408- in home position
- ◆ Entry and start authorisation button -E408- pressed

This results in the following operating concept:

Status before action	Action	Status after action
S-contact off (ignition off engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed)	Ignition on (engine off)
S-contact off (ignition off engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch pressed; vehicles with automatic gearbox: brake pressed and selector lever in N or P)	Engine on
Ignition on (engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch pressed; vehicles with automatic gearbox: brake pressed and selector lever in N or P)	Engine on



Status before action	Action	Status after action
Ignition on (engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed)	S-contact on (ignition off engine off)
Ignition on (engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed) and driver's door open	S-contact off (ignition off engine off)
Engine on	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: vehicle stationary; vehicles with automatic gearbox: selector lever in N or P) and driver's door closed	S-contact on (ignition off engine off)
Engine on	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: vehicle stationary; vehicles with automatic gearbox: selector lever in N or P) and driver's door open	S-contact off (ignition off engine off)
S-contact on (ignition off engine off)	– Entry and start authorisation button -E408- pressed (vehicles with manual gearbox: clutch not pressed; vehicles with automatic gearbox: brake not pressed) or – Opening driver's door or – Locking vehicle externally	S-contact off (ignition off engine off)

For „Advanced Key“ an emergency engine shut-off is also implemented which is the same for manual and automatic gearboxes. Two conditions must be met for emergency shut-off via the entry and start authorisation button -E408- :

- Brake pressed
- Speed <10 kmh

The following actions result in an emergency engine shut-off:

- Button pressed and held
- or
- Button pressed twice within one second

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3.6 Ignition key withdrawal lock

When inserted into the electronic ignition lock, the vehicle key is mechanically locked so that it can no longer be removed by the driver.

The key is released as soon as the ignition is switched off. Current is applied to a solenoid which releases the ignition key. The solenoid is located in the electronic ignition lock and receives current directly from the convenience system central control unit -J393- .

Depending on vehicle gearbox, one further condition must be met so that the key can be released:

Vehicles with automatic gearbox: The selector lever must be in position P.

Vehicles with manual gearbox: The vehicle must be stationary.

If the vehicle is unable to apply current to the ignition key withdrawal lock solenoid due to a technical defect while key is in the ignition lock, the key remains locked in place. To still be able to lock the vehicle, an emergency mechanical key bit can be taken out of the ignition key.

The emergency key is locked in the ignition key and can be used to mechanically lock the central locking system via the mechanical lock in the driver door.

The mechanical emergency key can be used to unlock the vehicle via the mechanical lock in the driver door if the vehicle cannot be unlocked using the remote control. It is also needed to deactivate the front passenger airbag.

3.7 Note for service

Due to the difference between vehicles with automatic and manual gearbox, it is important that the convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“ is correctly coded. The coding can be checked in „Guided Fault Finding“ or „Guided Functions“ using functional check „05 - Code control unit (Rep.Gr. 96)“. The coding can only be performed using „Software Version Management (SVM)“.

If the vehicle is unable to apply current to the ignition key withdrawal lock solenoid due to a technical defect while key is in the ignition lock, the key remains locked in place. To still be able to lock the vehicle, an emergency mechanical key bit can be taken out of the ignition key.

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4 Locking the steering column

4.1 General notes on the steering column lock

Locking of the steering column is handled by the electronic steering column lock control unit -J764-. This is not permanently attached to the steering column and can be renewed separately if it is defective.

If the electronic steering column lock control unit -J764- is defective, it is not necessary to renew the steering column (unlike on Audi A6, Q7 and A8).

Diagnosis of the electronic steering column lock control unit -J764- is performed via the convenience system central control unit -J393- at diagnostic address „05 - Entry and start authorisation“. Data are transferred via a „LIN bus“, to which the entry and start authorisation switch -E415- is also connected.

4.2 Locking and unlocking the steering column

The control unit J764 unlocks the steering column when:

- The ignition key is inserted into the entry and start authorisation switch -E415- .
- Terminal S is activated by pressing the entry and start authorisation button -E408- (for „Keyless Entry“).

The control unit J764 locks the steering column when:

- The ignition key is removed.
- The door is opened (when using keyless entry).

To lock the steering column the following additional conditions must be met:

- The ignition must be off.
- No terminal S should be detected.
- The vehicle must be stationary.

4.3 System overview for steering column lock

A precondition for locking the steering column for the electronic steering column lock control unit -J764- is that supply voltage has been detected on both the electronic steering column lock enable wires of the convenience system central control unit -J393- and the onboard supply control unit -J519-. This requires that both control units switch terminal 30 to the corresponding discrete wires for the duration of the unlock.

If the convenience system central control unit -J393- has received a „terminal 15 request“, successful unlocking of the steering column must first be checked before terminal 15 is switched.

This is done as follows:

- ◆ Upon receiving a „terminal 15 request“, the convenience system central control unit -J393- queries the electronic steering column lock control unit -J764- by way of a LIN bus message.
- ◆ If the steering column was successfully unlocked, this information is relayed to the convenience system central control unit -J393- via the discrete "enable terminal 15" wire. The en-



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able wire remains active for the entire time that the electronic steering lock control unit -J764- is unlocked.

- ◆ When the enable has been issued, the convenience system central control unit -J393- activates the terminal 15 relay.

4.4 Note for service

The discrete wires are diagnosed by the convenience system central control unit -J393- and the onboard supply control unit -J519- , and can be checked in „Guided Fault Finding“ using the following functional checks:

Select „46 - Convenience system central module | J393 “ „05 - Electrical components (=> in -J393)“ „J764 - ESL control unit (Rep.Gr.48)“:

- ◆ „J764 - ESL, enabling steering column lock (Rep.Gr.48)“ for discrete „ESL enable“ wire from convenience system central control unit -J393- to electronic steering lock control unit -J764- .
- ◆ „J764 - ESL, enabling terminal 15 (Rep.Gr.48)“ for discrete „terminal 15 enable“ wire from electronic steering lock control unit -J764- to convenience system central control unit -J393- .

Select „09 - Electronic central electrics | J519 “ „09 - Subsystems conditions“ :

- ◆ „J519 - onboard power supply control unit, enabling steering column lock“ for discrete „ESL enable“ wire from onboard supply control unit -J519- to electronic steering lock control unit -J764- .



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- ◆ *After renewing the steering column, the function „16 - Calibrate steering angle sender -G85- (Rep. Gr. 94)“ must be performed; the electronic steering column lock control unit -J764- can be left installed in the vehicle and does not have to be re-adapted.*
- ◆ *The function „* * - Service immobilizer“ only has to be performed if the electronic steering column lock control unit -J764- has been renewed.*

5 Advanced Key

5.1 General information on entry and start authorisation control unit „Advanced Key“

The „Advanced Key“ is available as an optional extra for vehicles with the immobilizer V. The concept was adopted from vehicles with the immobilizer IV, though optimisation has meant that the number of system components required has been reduced.

New features

The central locking buttons on the exterior door handles have been discontinued. Locking and unlocking are activated by touching the capacity sensors on the exterior door handle.

5.2 System overview of entry and start authorisation control unit „Advanced Key“

5.2.1 System overview for „Advanced Key“ (2-door vehicles)

1 - Entry and start authorisation button -E408-

2 - Contact sensor for front right exterior door handle - G606-

3 - Convenience system central control unit -J393-

4 - Central locking and anti-theft alarm system aerial -R47-

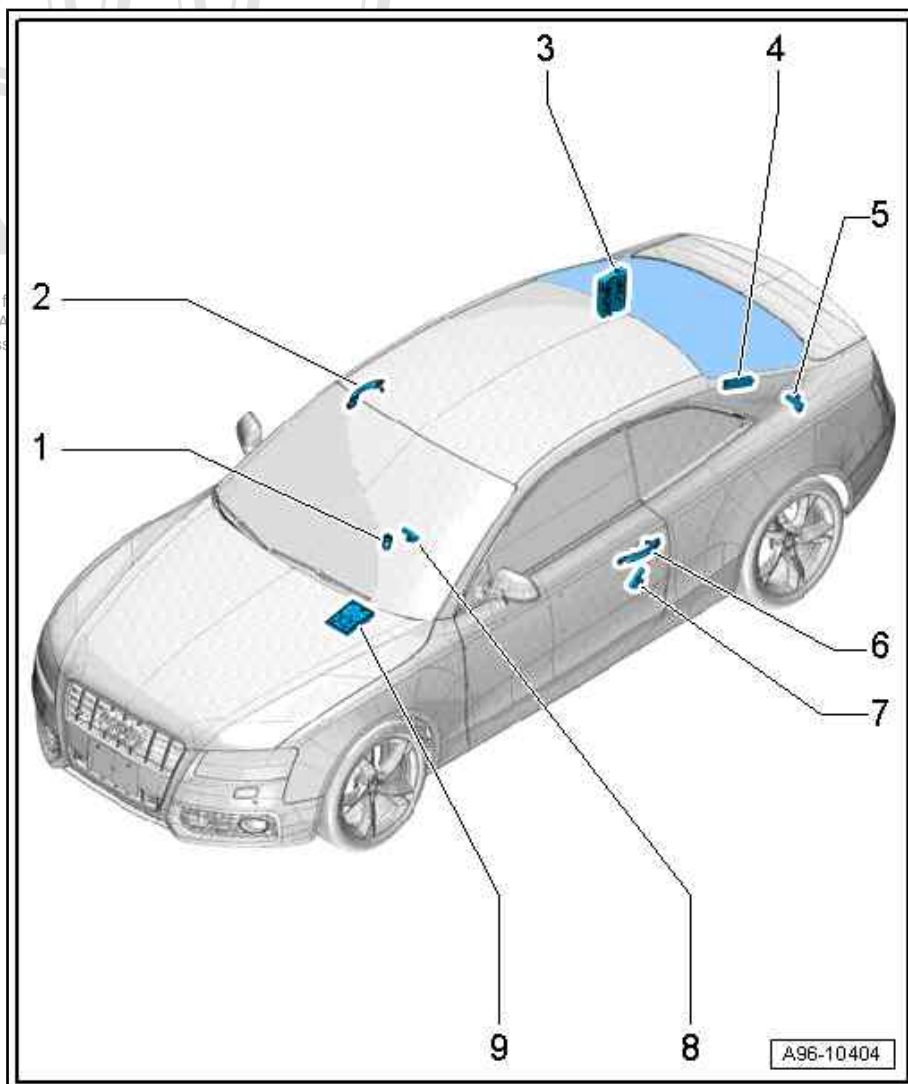
5 - Luggage compartment aerial for entry and start authorisation -R137-

6 - Contact sensor for front left exterior door handle -G605-

7 - Left aerial for entry and start authorisation -R200-

8 - Interior aerial 1 for entry and start authorisation -R138-

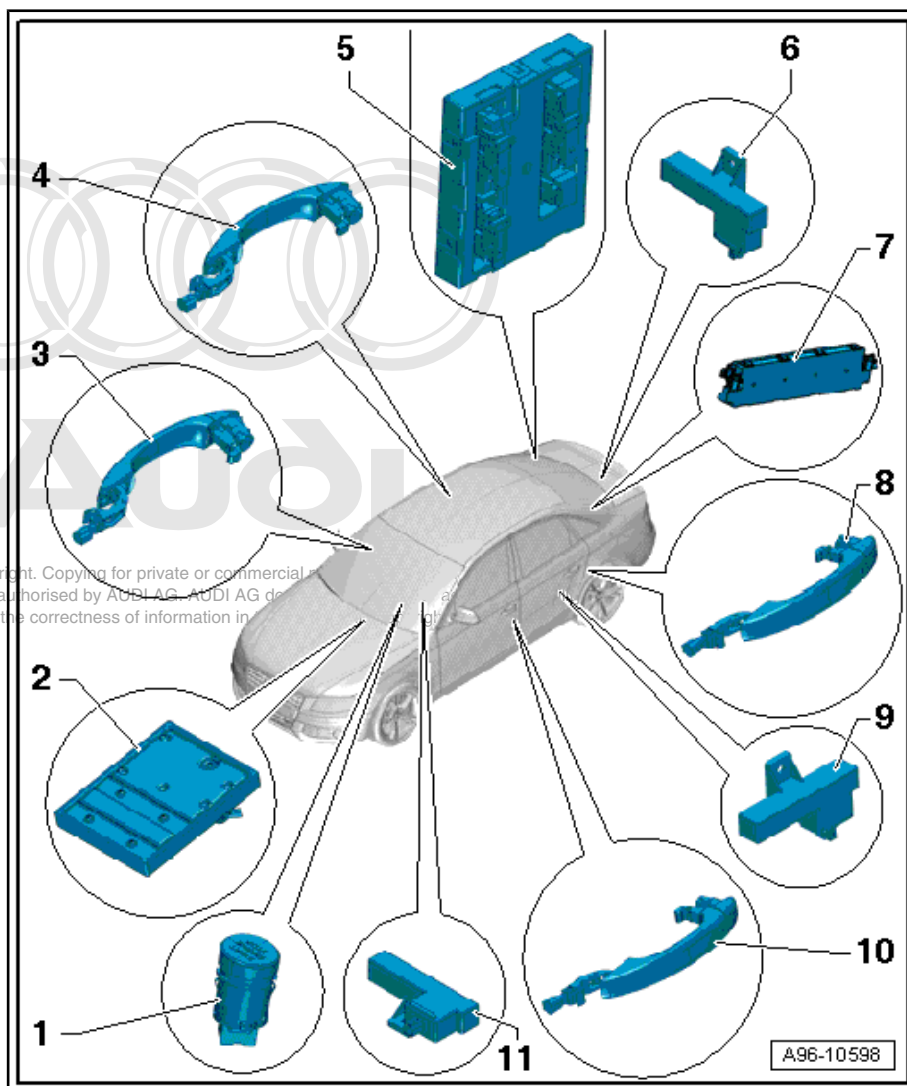
9 - Electronic steering column lock control unit -J764-



The components -J393-, -J764- and -R47- are fitted in both the standard version and the version with „Advanced Key“ as an optional extra. The remaining components are only fitted in the version with „Advanced Key“ as an optional extra.

5.2.2 System overview for „Advanced Key“ (4-door vehicles)

- 1 - Entry and start authorisation button -E408-
- 2 - Electronic steering column lock control unit -J764-
- 3 - Contact sensor for front right exterior door handle - G606-
- 4 - Rear right exterior door handle touch sensor -G418-
- 5 - Convenience system central control unit -J393-
- 6 - Luggage compartment aerial for entry and start authorisation -R137-
- 7 - Central locking and anti-theft alarm system aerial -R47-
- 8 - Rear left exterior door handle touch sensor -G417-
- 9 - Left aerial for entry and start authorisation -R200-
- 10 - Contact sensor for front left exterior door handle - G605-
- 11 - Interior aerial 1 for entry and start authorisation -R138-



The components -J393-, -J764- and -R47- are fitted in both the standard version and the version with „Advanced Key“ as an optional extra. The remaining components are only fitted in the version with „Advanced Key“ as an optional extra.

5.3 Note for service - „Advanced Key“ diagnosis

Diagnosis of the „Advanced Key“ system is performed by the convenience system central control unit -J393- at diagnosis address „05 - Entry and start authorisation“.

Related functional checks can be found in „Guided Fault Finding“ under „05 - Entry and start authorisation (= in -J393)“.



Note

The functional checks for the components of the „Advanced Key“ system can only be included in the test plan if control unit variant „05 - Vehicle authorisation system with Keyless Entry“ was selected in the „vehicle system test“ (i.e. when „Guided Fault Finding“ was started). If selected, the control unit variant is shown on a black background. If variant „05 - Vehicle authorisation system with Keyless Entry“ is not automatically detected, it must be selected manually. Only then can corresponding functional checks for „Advanced Key“ be entered in the test plan.



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